

WHAT IS CLAIMED IS:

1. A system for making fiber optic connections in a subterranean well,
5 the system comprising:

a first fiber optic connector positioned in the well; and

a second fiber optic connector operatively connected to the first fiber optic
connector after the first fiber optic connector is positioned in the well.

10 2. The system according to claim 1, wherein the first fiber optic
connector is operatively coupled to a fiber optic line which is configured to sense
a downhole parameter.

15 3. The system according to claim 1, wherein the first fiber optic
connector is operatively coupled to a fiber optic line which has a sensor
connected thereto.

20 4. The system according to claim 1, wherein the first fiber optic
connector is attached to a first downhole assembly, wherein the second fiber
optic connector is attached to a second downhole assembly, and wherein the first
and second assemblies are attached to each other downhole, thereby operatively
connecting the first and second fiber optic connectors.

5. The system according to claim 4, wherein the first and second assemblies are rotationally oriented with respect to each other prior to operatively connecting the first and second fiber optic connectors.

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6. The system according to claim 4, wherein each of the first and second assemblies is a gravel packing assembly.

7. The system according to claim 4, wherein the first assembly is a
10 gravel packing assembly, and wherein the second assembly is a production tubing string.

8. The system according to claim 1, wherein at least one of the first and second fiber optic connectors is operatively coupled to a fiber optic line
15 extending longitudinally through a packer.

9. The system according to claim 1, wherein the first fiber optic connector is operatively coupled to a first fiber optic line positioned external to a tubular string in the well, and wherein the second fiber optic connector is
20 operatively coupled to a second fiber optic line positioned internal to the tubular string.

10. The system according to claim 1, wherein the first fiber optic connector is attached to a tubular string, and wherein the second fiber optic connector is attached to an assembly received within the tubular string.

11. A system for making fiber optic connections in a subterranean well,
the system comprising:

a first assembly positioned in the well, the first assembly including a first
fiber optic connector;

5 a second assembly positioned in the well, the second assembly including a
second fiber optic connector; and

an orienting device orienting the first assembly relative to the second
assembly, thereby aligning the first and second fiber optic connectors.

10 12. The system according to claim 11, wherein each of the first and
second assemblies is a gravel packing assembly.

13. The system according to claim 11, wherein the first assembly is a
gravel packing assembly, and wherein the second assembly is a production tubing
15 string.

14. The system according to claim 11, wherein the first assembly is a
tubular string, and wherein the second assembly is received within the tubular
string.

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15. The system according to claim 14, wherein the second assembly is
conveyed on a running tool through the tubular string.

16. The system according to claim 15, wherein pressure applied between the running tool and the tubular string causes the first and second fiber optic connectors to operatively connect with each other.

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17. The system according to claim 11, wherein at least one of the first and second fiber optic connectors is operatively coupled to a fiber optic line extending through a packer in the well.

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18. The system according to claim 11, wherein the first fiber optic connector is operatively coupled to a first fiber optic line positioned external to a tubular string, and wherein the second fiber optic connector is operatively connected to a second fiber optic line positioned internal to the tubular string.

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19. The system according to claim 11, wherein the first and second fiber optic connectors are operatively coupled to respective ones of first and second fiber optic lines positioned external to a tubular string.

20. The system according to claim 11, wherein at least one of the first
20 and second fiber optic connectors is operatively coupled to a fiber optic line configured to sense a parameter in the well.

21. The system according to claim 11, wherein at least one of the first and second fiber optic connectors is operatively coupled to a fiber optic line attached to a sensor for sensing a parameter in the well.

5 22. The system according to claim 11, wherein the first assembly is a receptacle interconnected in a tubular string in the well, and wherein the second assembly is releasably secured in the receptacle.

10 23. The system according to claim 22, wherein the first and second connectors are operatively connected in response to pressure applied to the receptacle.

24. The system according to claim 22, wherein the second assembly extends into a third assembly positioned in the well.

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25. The system according to claim 24, wherein the third assembly is a gravel packing assembly.

20 26. The system according to claim 24, wherein the third assembly is positioned in the well prior to conveying the first assembly into the well.

27. The system according to claim 24, wherein the second assembly includes a fiber optic line operatively coupled to the second fiber optic connector, the fiber optic line extending into the third assembly.

5 28. The system according to claim 27, wherein the fiber optic line transmits an indication of a parameter sensed in the third assembly.

29. The system according to claim 27, wherein the fiber optic line is positioned external to the second assembly in the third assembly.

10 30. The system according to claim 27, wherein the fiber optic line is positioned internal to the second assembly in the third assembly.

31. The system according to claim 11, wherein pressure applied to the
15 first assembly causes operative connection of the first and second fiber optic connectors.

32. A method of making fiber optic connections in a subterranean well, the method comprising the steps of:

positioning a first assembly in the well, the first assembly including a first fiber optic connector;

5 positioning a second assembly in the well, the second assembly including a second fiber optic connector;

orienting the first and second assemblies in the well, thereby aligning the first and second fiber optic connectors; and

10 then operatively connecting the first and second fiber optic connectors in the well.

33. The method according to claim 32, wherein the orienting step further comprises rotationally orienting the first and second assemblies.

15 34. The method according to claim 32, further comprising the step of attaching the second assembly to the first assembly.

35. The method according to claim 34, wherein the attaching step further comprises securing the second assembly within the first assembly.

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36. The method according to claim 32, further comprising the step of sealing between the first and second assemblies.

37. The method according to claim 32, wherein each of the first and second assemblies is a gravel packing assembly, and wherein the orienting step further comprises rotationally orienting the second gravel packing assembly
5 relative to the first gravel packing assembly.

38. The method according to claim 37, further comprising the step of operatively coupling the first fiber optic connector to a first fiber optic line extending longitudinally relative to the first gravel packing assembly.

10 39. The method according to claim 38, further comprising the step of extending the first fiber optic line through a packer of the first gravel packing assembly.

15 40. The method according to claim 38, further comprising the step of operatively coupling the second fiber optic connector to a second fiber optic line extending longitudinally relative to the second gravel packing assembly.

20 41. The method according to claim 40, further comprising the step of extending the second fiber optic line through a packer of the second gravel packing assembly.

42. The method according to claim 32, wherein the first assembly is a gravel packing assembly, wherein the second assembly is a tubing string, and wherein the orienting step further comprises rotationally orienting the tubing string relative to the gravel packing assembly.

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43. The method according to claim 42, further comprising the step of operatively coupling the first fiber optic connector to a fiber optic line extending longitudinally relative to the tubing string.

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44. The method according to claim 42, further comprising the step of operatively coupling the second fiber optic connector to a fiber optic line extending longitudinally relative to the gravel packing assembly.

45. The method according to claim 44, further comprising the step of
15 extending the fiber optic line through a packer of the gravel packing assembly.

46. An apparatus for making a connection between lines in a subterranean well, the apparatus comprising:

an outer housing having a sidewall, and a passage extending through the housing;

5 a first connector positioned in the housing sidewall; and

a second connector received within the passage, the first and second connectors being operatively connectable after the apparatus is positioned in the well.

10 47. The apparatus according to claim 46, wherein the first connector is attached to a piston reciprocally received in the housing sidewall.

48. The apparatus according to claim 47, wherein pressure applied to the piston displaces the first connector into operative engagement with the
15 second connector.

49. The apparatus according to claim 47, wherein the second connector is attached to an assembly received within the passage, pressure applied through the assembly causing the first and second connectors to operatively engage.

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50. The apparatus according to claim 49, wherein the assembly includes a fiber optic line operatively coupled to the second connector, the fiber optic line extending longitudinally within the passage.

5 51. The apparatus according to claim 50, wherein the fiber optic line extends into a gravel packing assembly attached to the housing.

52. The apparatus according to claim 49, further comprising an orienting profile which rotationally orients the assembly relative to the housing,
10 thereby aligning the first and second connectors.

53. The apparatus according to claim 49, further comprising an anchoring device which releasably secures the assembly relative to the housing.

15 54. The apparatus according to claim 46, wherein each of the first and second connectors is a fiber optic connector.

55. The apparatus according to claim 46, wherein at least one fiber optic line is coupled to each of the first and second connectors.

20 56. The apparatus according to claim 46, wherein multiple types of lines are coupled to each of the first and second connectors.

57. The apparatus according to claim 46, wherein a selected one or more of fiber optic, electrical and hydraulic lines are coupled to each of the first and second connectors.

58. A system for making connections between lines in a subterranean well, the system comprising:

a packer assembly including a first orienting device and a first fiber optic connector; and

5 a tubular string including a second orienting device and a second fiber optic connector, and

wherein the first and second orienting devices align the first and second fiber optic connectors for operative connection therebetween when the tubular string is engaged with the packer in the well.

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59. The system according to claim 58, wherein a fiber optic line operatively coupled to the first connector extends longitudinally through the packer.

15 60. The system according to claim 58, further comprising a well screen attached to the packer.

61. The system according to claim 60, wherein a fiber optic line operatively coupled to the first connector extends longitudinally through the well
20 screen.

62. The system according to claim 60, wherein a fiber optic line operatively coupled to the first connector extends externally across the well screen.

5 63. The system according to claim 58, wherein the second connector is positioned external to the tubular string.

64. The system according to claim 58, wherein the tubular string includes a third connector.

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65. The system according to claim 64, wherein the third connector is positioned internal to the tubular string.

66. The apparatus according to claim 58, wherein at least one fiber
15 optic line is coupled to each of the first and second connectors.

67. The apparatus according to claim 58, wherein multiple types of lines are coupled to each of the first and second connectors.

20 68. The apparatus according to claim 58, wherein a selected one or more of fiber optic, electrical and hydraulic lines are coupled to each of the first and second connectors.

69. The apparatus according to claim 58, wherein the tubular string is secured to the packer when the tubular string is engaged with the packer in the well.

70. A system for making fiber optic connections in a subterranean well,
the system comprising:

a tubular string including a passage formed through the tubular string,
and a first fiber optic connector; and

5 an assembly received in the passage, the assembly including a second fiber
optic connector.

71. The system according to claim 70, wherein the first and second
connectors are operatively connected to each other after the tubular string is
10 positioned in the well.

72. The system according to claim 70, wherein the tubular string
includes a first orienting device, wherein the assembly includes a second
orienting device, and wherein engagement between the first and second orienting
15 devices aligns the first and second fiber optic connectors.

73. The system according to claim 70, wherein pressure applied to at
least one of the tubular string and the assembly causes relative displacement
between the first and second fiber optic connectors, thereby causing the first and
20 second fiber optic connectors to operatively connect.

74. The system according to claim 70, wherein pressure applied to at least one of the tubular string and the assembly causes relative displacement between the first and second fiber optic connectors, thereby causing the first and second fiber optic connectors to operatively disconnect.

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75. The system according to claim 70, wherein the second fiber optic connector is operatively coupled to a sensor of the assembly.

76. The system according to claim 75, wherein the sensor extends into a
10 gravel packing assembly.

77. The system according to claim 75, wherein the sensor monitors temperature distributed along the assembly.

15 78. The system according to claim 75, wherein the sensor identifies a location of influx of water from a formation intersected by the well.

79. The system according to claim 70, wherein the first fiber optic connector is operatively coupled to a fiber optic line extending external to the
20 tubular string.

80. The system according to claim 70, wherein the assembly is positioned in the passage when the tubular string is installed in the well, and wherein the assembly is displaced in the passage, thereby operatively connecting the first and second fiber optic connectors, after the tubular string is installed in
5 the well.

81. The system according to claim 70, wherein the assembly is positioned and displaced in the passage, thereby operatively connecting the first and second fiber optic connectors, after the tubular string is installed in the well.

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82. The system according to claim 70, wherein the assembly is secured to the tubular string when the assembly is received in the passage.

83. A method of monitoring a subterranean well, the method comprising the steps of:

positioning a first fiber optic line in the well, the first fiber optic line extending in a formation intersected by the well;

5 positioning a second fiber optic line in the well, the second fiber optic line extending to a remote location;

operatively connecting the first and second fiber optic lines while the first and second fiber optic lines are in the well; and

10 monitoring a well parameter using a sensor operatively coupled to the first fiber optic line.

84. The method according to claim 83, wherein in the monitoring step the sensor is a portion of the first fiber optic line.

15 85. The method according to claim 83, wherein the monitoring step further comprises using the sensor to sense a selected one or more of seismic, pressure, temperature, water cut, flow rate, radioactivity and phase parameters.

86. The method according to claim 83, wherein in the monitoring step
20 there are multiple ones of the sensor distributed along the first fiber optic line.

87. The method according to claim 83, wherein the monitoring step further comprises monitoring well temperature distributed along the first fiber optic line.

5 88. The method according to claim 83, wherein the monitoring step further comprises identifying a location of influx of water from the formation into the well.